

Two New Species of *Chicoreus* Subgenus *Siratus* (Gastropoda: Muricidae) From Northeastern Brazil

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ABSTRACT

Two new species of muricid gastropods are described herein from the vicinity of Salvador, Bahia, Brazil. Both forms have been known for some time but have been misidentified in the literature. *Chicoreus (Siratus) carolynae* has been identified as "*Murex chrysostoma* Sowerby," but differs in having a deflected siphonal canal. *Chicoreus (Siratus) coltrorum*, has been identified as "*Murex consuela* (Verrill)," but differs in having a paucispiral protoconch.

Key words: Muricidae; Gastropoda; *Chicoreus*; *Siratus*; Brazil.

INTRODUCTION

Most authors (e.g., Abbott, 1974; Rios, 1970, 1975, 1980) have identified mollusks from eastern Brazil by the names of well known Caribbean species. In some cases, these identifications are proving to be incorrect. In this paper two previously misidentified species of muricid gastropods are described.

One of these, described herein as *Chicoreus (Siratus) carolynae*, is of particular interest as it demonstrates the close relationship, not well understood heretofore, between members of *Haustellum* Seumacher, 1817, and *Siratus* Jousseaume, 1880. When I first began studying the Muricidae of the western Atlantic (Vokes, 1963) I assigned all species with three spinose varices and a long siphonal canal to *Murex sensu stricto*. Within this group, I separated two subgroups: the "Indo-Pacific" form, with a straight siphonal canal; and the "Western Atlantic" form, in which the canal was deflected dorsally (see figure 1b). Further work on the family (Vokes, 1965) convinced me that the latter group should be taken out of *Murex* and transferred to the subgenus *Siratus*, which I felt was better placed within the genus *Chicoreus*, leaving only those species with a long straight canal in the genus *Murex*.

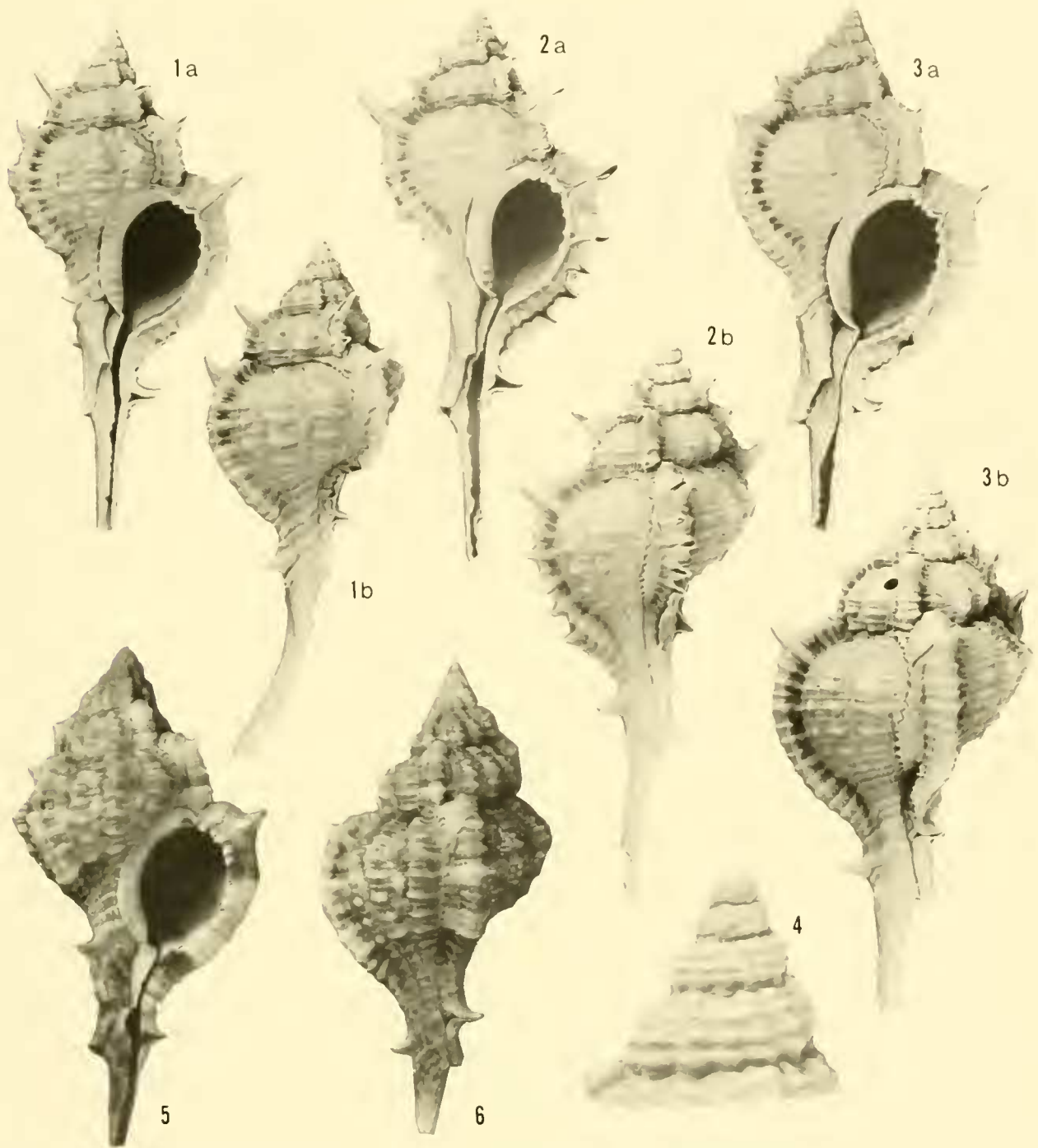
More recent work on the genus *Murex* in the Indo-west Pacific (Ponder and Vokes, 1988) disclosed that there are certain morphological differences between *Murex* and *Haustellum*, including the presence of a labral tooth in species of *Murex* but not in *Haustellum*, the

presence of rugae on the parietal lip in species of *Haustellum* but not in *Murex*, as well as differences in early teleoconch ornamentation, color pattern, and other features. This convinced me that not only the three spinose varices present in both *Murex* and *Siratus* but also the long straight canal in *Murex* and *Haustellum* are a result of convergence. The ultimate conclusion brought about by work on the Indo-Pacific species of *Murex* and *Haustellum* was the somewhat disturbing realization that there are no species of *Murex* in the Western Hemisphere (with one possible exception—*Murex surinamensis* Okutani, 1982) and that all the western Atlantic "Indo-Pacific" forms of *Murex (sensu Vokes, 1963)* are actually to be placed in the genus *Haustellum*.

This shift in nomenclature was corroborated by work done on the fossil muricids of the Dominican Republic (Vokes, 1989), where one sees two species that are so similar as to be very difficult to distinguish—except that one (*Murex messorius* Sowerby, 1841) has a straight siphonal canal and is assigned to *Haustellum* and the other (*Murex domingensis* Sowerby, 1850) has a deflected canal and is assigned to *Siratus*. I believe that the similarities seen in these two species transcend convergence and reflect close phylogenetic affinity.

On the basis of the geologic history of the two groups, it seems probable that the New World species, which are taxonomically separated into two distinct genera—*Haustellum* and *Chicoreus*, are much more closely related to each other than either is to true *Murex*. Nowhere is this more obvious than in the species described below, which has heretofore been identified as *Haustellum chrysostoma*, or a variety thereof, but which is here placed in the subgenus *Siratus*. Perhaps the strongest similarity between *H. chrysostoma* and *C. (S.) carolynae*, n. sp., is the color pattern, in which the *Siratus* species repeats the typical brown and white striped pattern of many species of *Haustellum*.

This color pattern is just one of the many characters that is used to separate *Haustellum* from *Murex*. The true species of *Murex* are usually monochromatic cream or tan in color, have a distinct labral tooth and a smooth parietal lip. Species of *Haustellum*, and of *Siratus* usually have brown and white spiral bands, no labral tooth, and



Figures 1-6. *Chicoreus (Siratus) carolynae*, n. sp. ($\times 1\frac{1}{2}$). 1. USNM 860504 (holotype); height 52.8 mm, diameter 24.4 mm, Ilha de Itaparica, Bahia. 2. USNM 860505 (paratype 1); height 56.0 mm, diameter 24.5 mm, Ilha de Itaparica, Bahia. 3. 4. USNM 860505 (paratype 2); height 53.8 mm, diameter 27.0 mm (figure 4, $\times 10$), Ilha de Itaparica, Bahia. 5. MORG 20.748 (paratype 3); height 49.6 mm, diameter 25.3 mm, Itapuã, Bahia. 6. MORG 22.129 (paratype 4); height 47.6 mm, diameter 23.2 mm, Yacht Club, Salvador, Bahia; 10 m. All specimens collected dead, all except that in figure 6 at low tide. Specimens in figures 1-4 whitened to show details of ornamentation.

a rugose parietal lip. In addition, in those species of *Haustellum* with relatively well-developed varical spines (e.g., *Haustellum kitiensis* [Kira, 1959]) there is a tendency to develop webbing between the spines. This is carried to its fullest extreme in *Siratus*. The only differ-

ence between *Haustellum* and *Siratus* is the presence of a straight *vs.* a deflected siphonal canal. In other words, what I was attempting to distinguish in 1963 was not two groups of *Murex* but *Haustellum* and *Siratus*!

In the second species, described below as *C. (S.) col-*

trorum, we have a more straightforward case of two superficially similar forms, with the Brazilian species having previously been misidentified as *C. (S.) consuela*. These two species differ primarily by the nature of the protoconch. A similar case has also been discovered in the two similar appearing, and often synonymized, species *Chicoreus (Phyllonotus) pomum* (Gmelin, 1791) and *C. (P.) oculatus* (Reeve, 1845) that may be unequivocally distinguished by different types of protoconchs (Houart, 1987). Throughout the Muricidae the nature of the protoconch is extremely stable, and is the best means of distinguishing similar appearing species (Ponder and Vokes, 1988, p. 3).

SYSTEMATIC DESCRIPTIONS

Class *Gastropoda*

Family *Muricidae* Rafinesque, 1815

Subfamily *Muricinae* Rafinesque, 1815

Genus *Chicoreus* Montfort, 1810

Chicoreus Montfort, 1810, *Conchyl. Syst.*, v. 2, p. 611.

Type species: *Murex ramosus* Linn., 1758, by original design.

Subgenus *Siratus* Jousseaume, 1880

Siratus Jousseaume, 1880, *Le Naturaliste*, Année 2, no. 42, p. 335.

Type species: "*Purpura sirat*" Adanson (= *Murex senegalensis* Gmelin, 1791), by original design.

Chicoreus (Siratus) carolynae, n. sp.

Figures 1–6

Murex chrysostoma Sowerby, var.? Rios, 1970, *Coastal Brazilian Seashells*, p. 77, pl. 21; Rios, 1975, *Brazilian Marine Mollusks* (con.), p. 84, pl. 24, fig. 339.

Murex chrysostoma Sowerby. Rios, 1985, *Seashells of Brazil*, p. 81, pl. 29, fig. 354 (not of Sowerby).

Description: Shell with seven teleoconch whorls. Protoconch of one and one-half rounded whorls with a small keel adjacent to the suture, ending at a sharp varix. Spiral ornamentation on early teleoconch whorls of three to five indistinct cords, best seen where crossed by axial ridges. Number of axial cords increasing gradually. Body whorl ornamented by six to eight cords, alternating with weaker secondary cords. In some cases, weaker tertiary threads present. Cord at shoulder somewhat stronger than others. Six to eight relatively weak cords on siphonal canal, some alternating with tertiary threads. Axial ornamentation on earliest teleoconch whorls of twelve rounded ridges per whorl. Beginning at fourth teleoconch whorl every fourth ridge strengthened into a small rounded varix. Remaining ridges persisting as intervarical nodes. Number of intervarical nodes between each pair of varices sometimes decreased to only two on latest teleoconch whorls but most commonly three present on all whorls. Three varices per whorl beginning on approximately sixth te-

leoconch whorl and persisting to adult stage. Raised ridges formed at intersection of spiral cords and varices. Small spines developed on varices only at shoulder and juncture of body whorl and siphonal canal. Rarely a small flange along the outer margin of the anterior portion of the varix. Aperture elongate-oval, parietal lip appressed at posterior end, free-standing at anterior end, with one strong anal tooth at posterior end and several rugae over entire length, but stronger on anterior half. Margin of outer lip scalloped by spiral cords, with a notch at intersection of each cord and edge of lip. Deeper notches corresponding to stronger cords. Anterior half of margin extended more adaperaturally than posterior half. At meeting of spiral cords and axial ridges small elongate welts raised on top of ridges, giving entire surface of intervarical area a nodulose appearance. Siphonal canal long, narrow, almost sealed, open only by a narrow slit. Siphonal canal deflected dorsally, with terminations of former canals remaining as a series of spurs surrounding base of body whorl. Color ranging from white to tan with brown spiral bands. Brown band at shoulder and base of body whorl darker. On margin of outer lip a dark spot of brown staining each notch formed by spiral cords. Operculum reddish-brown, typically muricine with a terminal nucleus.

Holotype: USNM 860504; height 52.8 mm, diameter 24.4 mm (figure 1).

Paratype 1: USNM 860505; height 56.0 mm, diameter 24.5 mm; type locality (figure 2).

Paratype 2: USNM 860505; height 53.8 mm, diameter 27.0 mm; type locality (figures 3, 4).

Paratype 3: MORG No. 20.748; height 49.9 mm, diameter 25.3 mm; Itapuã, Bahia, low tide. Coll. L. C. Araújo, 1975 (figure 5).

Paratype 4: MORG No. 22.129; height 47.5 mm, diameter 23.2 mm; Yacht Club, Salvador, Bahia, 10 m depth. Coll. Bernardo Linhares, 1982 (figure 6).

Paratype 5: MORG No. 8016; height 45.3 mm, diameter 22.9 mm; Bahia, 13 m depth. Coll. B. Tursch, 1962 (Rios, 1970, pl. 21, *M. chrysostoma* var.?—apertural view only; 1975, pl. 25, fig. 339; 1985, pl. 29, fig. 354).

Other material studied: Five unfigured paratypes: MORG No. 8016; height 59.8 mm, diameter 28.7 mm; Bahia, 13 m. MORG No. 20.748; specimen *a*, height 47.0 mm, diameter 23.4 mm; specimen *b*, height 40.4 mm, diameter 22.3 mm; specimen *c*, height 36.9 mm, diameter 19.8 mm; Itapuã, Bahia, at low tide. MORG No. 22.129; height 53.3 mm, diameter 26.5 mm; Yacht Club, Salvador, Bahia 10 m. Also 14 additional specimens collected by Carolyn Voss, from type locality.

Type locality: Ilha de Itaparica, Bahia, at low tide.

Discussion: This species has been figured by Rios as *Murex chrysostoma* Sowerby, 1834, var.? (1970, 1975) and later as *Murex chrysostoma*. In the first two editions he correctly identified true *Haustellum chrysostoma*

(1970, pl. 20; 1975, pl. 24, fig. 338) but in the third edition (1985) he changed this identification to *Murex messorius* Sowerby, 1841 (1985, p. 81, pl. 29, fig. 355) and changed the former "*Murex chrysostoma* var.?" to *Murex chrysostoma* (1985, p. 81, pl. 29, fig. 354), indicating the reason for the change was that *M. chrysostoma* may be "distinguished from *messorius* by the radular teeth." This statement is based upon a mix-up of illustrations in an otherwise excellent study of the muricid species found on the coast of Venezuela by Gonzalez and Flores (1972). In this work they illustrate (figure 9-c) a thaidine radula (probably *Thais haemastoma*) as "*Murex chrysostomus*." It appears very different from the radula of *Murex messorius*. There is no difference between the radulae of *M. messorius* and *M. chrysostoma*, both are typically muricine. Gonzalez and Flores have also illustrated as the radula of *Murex donmoorei* Bullis, 1964 (their figure 9-b), another thaidine radula. It would appear that two illustrations have been switched, their figures 9 and 2, for the latter shows as rachidian teeth of *Thais deltoidea*, *T. rustica*, and *T. haemastoma floridana*, three illustrations of muricine radulae (presumably *Murex* cf. *messorius*, *M. donmoorei*, and *M. chrysostoma*, as indicated for figure 9).

Although confounded with *Haustellum chrysostoma* by Rios, the two forms bear only a general resemblance to each other, in that both have three essentially non-spinose varices, a long siphonal canal, and brown color bands. The closest relationship is actually with the members of the group of *C. (S.) motacilla* (Gmelin, 1791), *C. (S.) cailleti* (Petit de la Saussaye, 1856), and *C. (S.) cailleti kugleri* (Clench and Pérez Farfante, 1945). These three closely related forms have been well figured by Clench and Pérez Farfante (1945: pl. 9, figs. 1, 2, *C. cailleti* form *kugleri*; figs. 3, 4, typical *C. cailleti*; and figs. 5, 6, *C. perelegans* Vokes, 1965 [new name for *Murex elegans* Sowerby non Donovan], not *C. cailleti*, as indicated; and pl. 11, *C. motacilla*). This new species differs from *C. motacilla* in being more slender, with a narrower siphonal canal and with usually three weaker intervarical nodes between each pair of varices, in contrast to the invariably two, strong nodes seen in *C. motacilla*. In this respect, *C. carolynae* more nearly resembles *C. (S.) cailleti* form *kugleri*, which in the early whorls usually has four intervarical nodes between each pair of varices. This number decreases to only two in the adult stage, as in typical *C. cailleti* and *C. motacilla*. Again, the differences between *C. carolynae* and *C. kugleri* are the more slender body and less deflected siphonal canal in *C. carolynae*.

This new species is known to occur only in the State of Bahia, Brazil, in shallow water. In addition to the type material, Rios has reported it from Ponta Jaburu, in 7 fms (10 m), and Pôrto da Barra, noting that it lives on sandy bottoms. He suggests that it is "perhaps a shallow water form" of *H. chrysostoma* (1970, p. 77). In the latest edition (1985, p. 81) he states that the species is dredged from 18 to 90 m on sandy bottoms, but this may reflect confusion with true *H. chrysostoma*. All type ma-

terial was collected in water shallower than 10 m, but most of it was beach material inhabited by hermit-crabs, and consequently the living depth is unknown.

Chicoreus (Siratus) coltrorum, n. sp.
Figures 7–13

Murex (Murex) pulcher Adams. Clench, 1959, *Johnsonia*, v. 3, no. 39, p. 333.

[?] *Murex (Murex) consuelae* Verrill. Bullis, 1964, *Tulane Stud. Zoology*, v. 11, no. 4, p. 103.

Murex (Murex) pulcher Adams. Rios, 1970, *Coastal Brazilian Seashells*, p. 77, pl. 20.

Siratus consuela (Verrill). Rios, 1975, *Brazilian Marine Mollusks* Icon., p. 84, pl. 24, fig. 342.

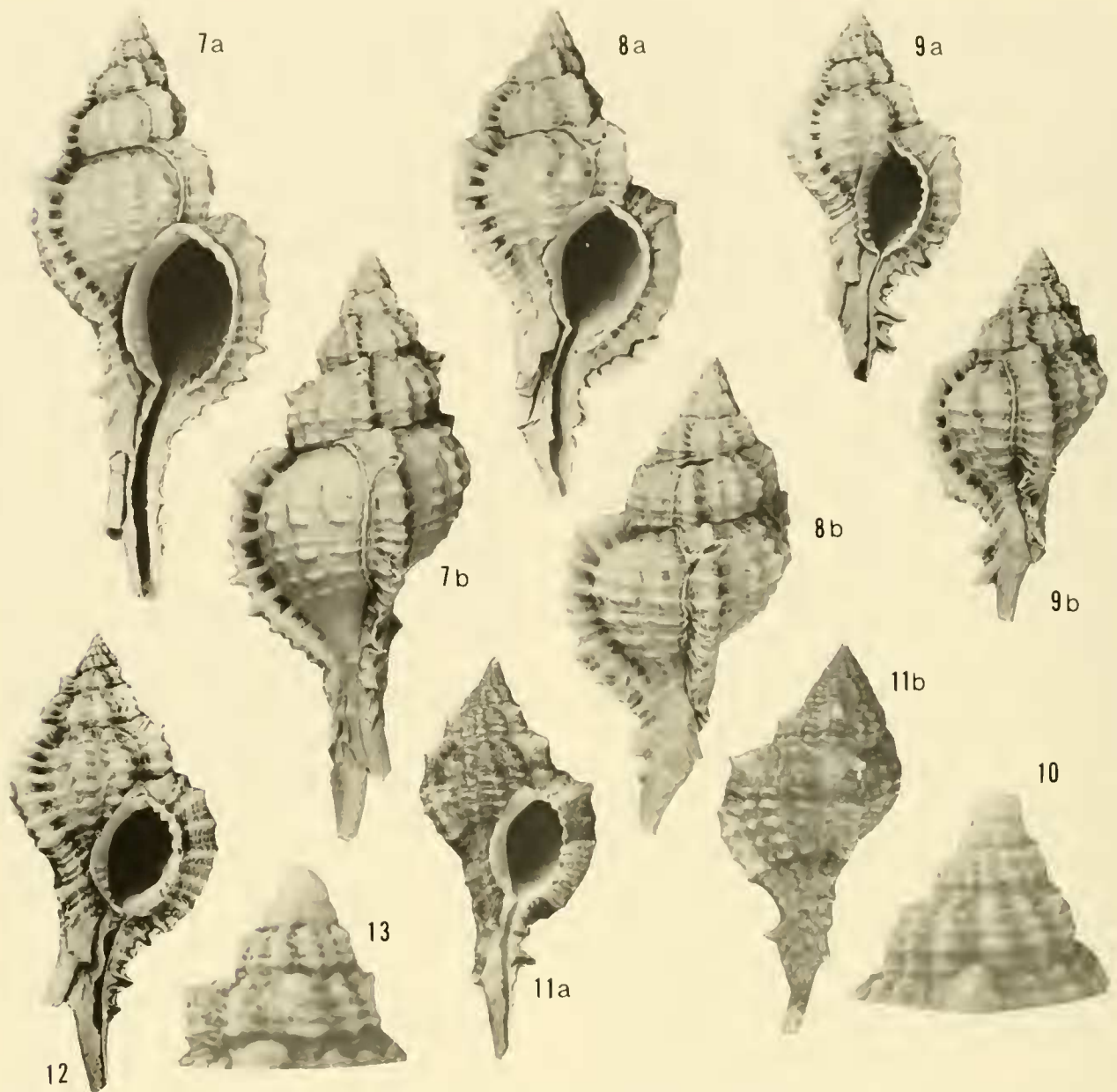
Murex (Murex) consuelae (Vokes) [sic]. Rios, 1985, *Seashells of Brazil*, p. 82, pl. 29, fig. 357.

Description: Shell with seven teleoconch whorls. Protoconch of one and one-half bulbous whorls, ending at a small, sharp varix. Suture deeply impressed. Spiral ornamentation on earliest teleoconch whorls of three small cords. A fourth cord and intermediate secondary cords gradually appearing on shoulder ramp. On body whorl eight major cords present, plus an additional four or five on siphonal canal, each pair separated by a secondary thread. Axial ornamentation on earliest teleoconch whorls of about 12 small ridges, forming nodes at intersection with spiral cords. On approximately fourth teleoconch whorl every fourth ridge enlarging into a small, rounded varix. Other three remaining as intervarical ridges between each pair. These persisting up to body whorl, most adapertural ridge sometimes weaker than other two. On about fifth teleoconch whorl small open spines developed on shoulder, at juncture of spiral cord and varices. In intervarical area, at intersection of spiral cords and axial ridges, small elongated nodes produced, two nearest to spiral cord at shoulder often fused into one larger node. Raised welts at crossing of spiral cords over varices, corresponding in size to strength of cord. A small flange sometimes produced on anterior portion of varices but not extending onto siphonal canal. The latter, instead, with usually two small open spines. Aperture elongate-oval. Parietal lip free-standing at anterior end, appressed at posterior end with a large anal tooth. Several rugae along entire length of parietal lip but stronger on its anterior half. Margin of outer lip crenulated by termination of spiral cords, inner side of outer lip with a series of elongate, often paired lirae. Siphonal canal long, almost straight, distal end deflected dorsally. Siphonal canal almost sealed, open only by a narrow slit. Color white to orange to tan with two darker brown spiral bands, one at periphery and one at base of body whorl. Operculum unknown.

Holotype: MORG No. 20.749; height 54.0 mm, diameter 22.4 mm (figure 7).

Paratype 1: MORG No. 20.749A; height 45.2 mm, diameter 21.1 mm; type locality (figure 8).

Paratype 2: MORG No. 15.203; height 28.7 mm, diameter 14.1 mm; off Recife, Pernambuco, 100 m. R/V



Figures 7–11. *Chicoreus (Siratus) coltrorum*, n. sp. **7.** MORG 20.749 (holotype); height 54.0 mm, diameter 22.4 mm ($\times 1\frac{1}{2}$), Ilha de Itaparica, Bahia. **8.** MORG 20.749A (paratype 1); height 45.2 mm, diameter 21.1 mm ($\times 1\frac{1}{2}$), Ilha de Itaparica, Bahia. **9.** **10.** MORG 15.203 (paratype 2); height 28.7 mm, diameter 14.1 mm (figures 9a, 9b, $\times 2$; figure 10, $\times 10$), Recife, Pernambuco; 100 m. **11.** USNM 860506 (paratype 3); height 30.6 mm, diameter 14.2 mm ($\times 2$), Ilha de Itaparica, Bahia. Except for specimen in figures 9, 10, all specimens taken dead at low tide. **Figures 12, 13.** *Chicoreus (Siratus) consueta* (Verrill) Vokes Coll.; height 46.3 mm, diameter 20.0 mm (figure 12, $\times 1\frac{1}{2}$; figure 13, $\times 10$), Soufrière, Dominica, West Indies; 30–40 fms (54–73 m) in fish-trap). All specimens except specimen in figure 11 whitened to show details of ornamentation.

Almirante Saldanha, 1968; specimen figured by Rios, 1970, pl. 20 (back view) (figures 9, 10).

Paratype 3: USNM 860506; height 30.6 mm, diameter 14.2 mm; type locality (figure 11).

Paratype 4: MORG No. 15.082; height 29 mm, diameter 15 mm; off Recife, Pernambuco; specimen figure by Rios: 1970, pl. 20 (apertural view); 1975, pl. 24, fig. 342; 1985, pl. 29, fig. 357.

Other material studied: Six unfigured paratypes. MORG No. 20.749; specimen *a*, height 53.0 mm, diameter 24.9 mm; specimen *b*, height 43.0 mm, diameter 20.7 mm; type locality. MORG No. 11.234; specimen *a*, height 38.2 mm, diameter 18.0 mm; specimen *b*, height 34.4 mm, diameter 15.2 mm; Pôrto da Barra, Salvador, Bahia. MORG No. 19.315; specimen *a*, height 40.9 mm, diameter 18.6 mm; specimen *b*, height 36.5 mm, diameter 16.4 mm; type locality. Plus eight additional specimens

collected by José and Marcos Coltro, from type locality, and one collected by them from Guarapari, Espírito Santo.

Type locality: Ilha de Itaparica, Bahia, at low tide.

Discussion: As is obvious from the synonymy given above, this species has been considered to be the form originally described as *Murex pulcher* A. Adams, 1853. This taxon is preoccupied by *Murex pulcher* Sowerby, 1813, and DeFrance, 1827, and the next available name is *Murex consuela* Verrill, 1950. The Brazilian species is a similar-appearing form that differs, however, in one critical feature—the protoconch is markedly different.

Both *C. consuela* and *C. coltrorum*, n. sp., are presumed to be descendants of *C. (S.) eumekes* Vokes, 1989, described from the Mio-Pliocene Gurabo Formation of the Dominican Republic. This fossil species has a protoconch consisting of three and one-half whorls; *C. consuela* has a protoconch of two and one-quarter whorls (see figure 12) and the Brazilian species has a protoconch of one and one-half whorls (see figure 10). Inasmuch as the usual trend in the Muricidae is to decrease the number of whorls through time, implying a change in reproductive strategy from planktotrophic to lecithotrophic to direct development, this decrease would suggest that the Brazilian species is the most recent offshoot from the ancestral line.

With the exception of the protoconch, the differences between *C. consuela* and *C. coltrorum* are minimal. One other noticeable difference is the suture, which is more impressed in *C. coltrorum*, causing the individual whorls to appear more rounded and distinct than in *C. consuela*. In *C. coltrorum* the siphonal canal is narrower, less deflected dorsally, and does not develop the flange that is seen in *C. consuela*. The development of the varices on the early whorls in *C. coltrorum* differs in that no varices appear until the fourth teleoconch whorl and no spines are produced on these varices until the fifth whorl. In contrast, in *C. consuela* the pattern develops one whorl earlier, i.e., varices on third teleoconch whorl and spines on fourth whorl.

In the Pleistocene and Recent faunas of the Caribbean *C. consuela* is widespread, occurring in the Pleistocene Moín Formation of Costa Rica, and in the Recent fauna from off the coast of Texas (Houston Mus. Nat. Sci., from Flower Garden Banks) to Curaçao (de Jong and Coomans, 1988, p. 71), but most commonly in the Lesser Antilles, usually in depths of 70 to 100 m.

The new species seems to be restricted to the coast of northeastern Brazil from the islands off Rio Grande do Norte as far south as Espírito Santo. Rios (1975, p. 84) has reported it from Atol das Rocas, Fernando de Noronha, off Recife, Pernambuco, and off Vitória, Espírito Santo, in depths from 35 to 100 m. Except for Rios' figured specimen (paratype 2) from 100 m, most of the type lot was collected at low tide, and consists of shells occupied by hermit-crabs.

Clench (1959, p. 333) reported "*Murex (Murex) pulcher*" from about 30 km off northernmost Bahia, in 40

fms (= 73 m). His specimen (MCZ 164967) unfortunately lacks the critical protoconch, but otherwise is identical to Rios' figured specimen (paratype 2, herein), and, given the locality there seems little doubt about the reference to the new species.

Bullis (1964, p. 103) has also reported "*Murex (Murex) consuelae*" from about 300 km east of Ilha de Maracá, Amapá, just north of the mouth of the Amazon, in 53 fms (= 97 m). This specimen cannot be located in the U.S. National Museum and given its locality, north of the Amazon, is only questionably included.

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ABBREVIATIONS OF REPOSITORY COLLECTIONS

- MCZ—Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA.
MORG—Museu Oceanográfico, Fundação Universidade do Rio Grande, Rio Grande do Sul, Brazil.
USNM—U.S. National Museum of Natural History, Washington, D.C., USA.

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